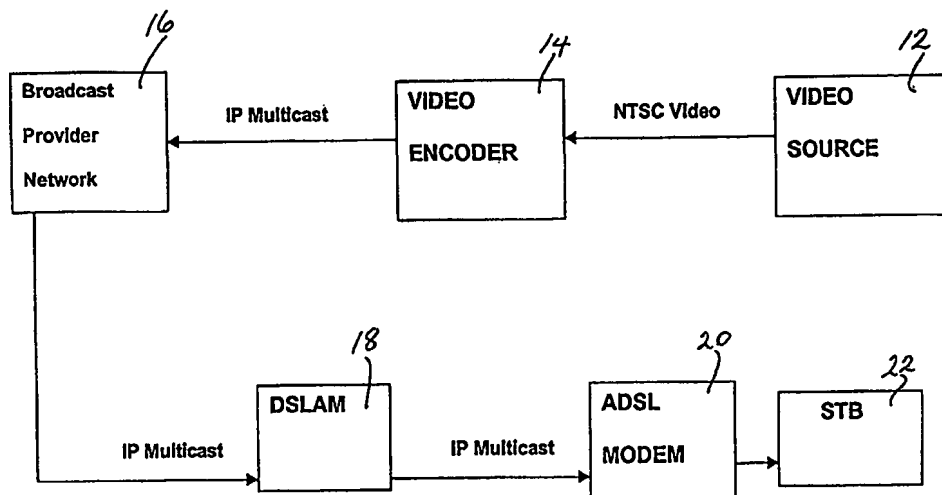


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(71) Applicant (for all designated States except US): IMAGICTV INC. [CA/CA]; 14th floor, One Brunswick Square, P.O. Box 303, Saint John, New Brunswick E2L 3Y2 (CA).			
(72) Inventors; and			
(75) Inventors/Applicants (for US only): CAMERON, Allan [CA/CA]; 5 Clark Hill Crescent, Saint John, New Brunswick E2L 5P6 (CA). POMEROY, Trenton [CA/CA]; 2328 Rothesay Road, East Riverside, New Brunswick E2H 2K5 (CA). ALSTON, David [CA/CA]; P.O. Box 96, Welsford, New Brunswick E0G 3G0 (CA). HIGGINS, Sean [CA/CA]; 468 Millidge Avenue, Saint John, New Brunswick E2K 2N4 (CA). JONES, Ian [CA/CA]; 9 Capri Avenue, Rothesay, New Brunswick E2E 4Y1 (CA). SWANSBURG, Darren [CA/CA]; 13 Logan Drive, Quispamsis, New Brunswick E2E 1B1 (CA). FURLONG, Jeff [CA/CA]; 36 Lake Road, Quispamsis, New Brunswick E2E 4P9 (CA).			

Published*Without international search report and to be republished upon receipt of that report.***(54) Title:** TELEVISION DELIVERY SYSTEM**(57) Abstract**

A system for delivering broadcast television over the Internet Protocol is described. A broadcast provider obtains television signals from traditional sources such as satellite or cable and encodes the signals for delivery to a subscriber/user over an IP enabled broadband network. An IP multicast protocol is used for conventional TV programming and near video on demand movie selections. An IP unicast protocol is used for video on demand services. A user/subscriber has a television/set top box or a PC with appropriate software to decode the IP format for program viewing. An interactive electronic program guide, viewable on the subscriber's monitor, provides the subscriber with access to a range of viewing features and system management functions.

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TELEVISION DELIVERY SYSTEM

Technical Field

This invention relates generally to a delivery system for digital television and more particularly to a system and method for the delivery and end to end management of interactive television and integrated Web services.

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Background Art

With the proliferation of TV broadcast providers delivering regular programming as well as specialty services, such as pay per view and first run movies, TV viewers are frequently faced with scheduling problems in order to view their favorite programs. The scheduling problem is even more severe in a typical household having one television with several potential viewers each having their own viewing preferences.

20

TV broadcasts are currently delivered through service providers such as cable companies, and satellite operators and, of course, direct broadcast reception via traditional antennas and rabbit ears. Conventional cable service requires the installation of a dedicated cable to the subscriber's residence. Satellite broadcast service requires that the user have a satellite dish located on or somewhere close to their residence. Antennas and rabbit ears are generally limited to the reception of local programming. Additionally, program delivery via all of these services is at the convenience of the service provider or broadcaster and, hence, the user or subscriber must arrange his or her schedule to coincide with program availability.

30

It is well known that the purchase of personal computers by homeowners has increased dramatically in recent years. Typically, these computers are used for word processing, accounting and other record keeping purposes. Most of these computers also have modems for connection to the Internet through an Internet Service Provider utilizing conventional telephone service. Frequently, however, these modems have a low baud rate that makes downloading of information, particularly graphics, unacceptable.

Disclosure of the Invention

In view of the foregoing there is a requirement to provide an improved method of delivering broadcast television and providing Internet access to subscribers of such services. The present invention relates to a system that provides the hardware and the necessary software for a broadcast provider, which may be a telephone company, to offer a wide range of managed broadcast television services to consumers. In accordance with various aspects of the invention these services include: end to end network administration; Interactive Program Guide (IPG) functionality offering self-serve pay-per-view, video on demand and Internet access; customer profile management; billing and payment capabilities; consumer arranged service options; channel packaging; user activity collection; statistics and reporting; video games; basic television; and VCR functionality including self-serve viewing of previously broadcast programs.

Through the present invention broadcast providers such as telephone companies are afforded the opportunity to compete

successfully in the broadcast TV market. With the combination of high speed, IP capable technologies, (for example, ATM, xDSL, MPEG-1 and MPEG-2, and IP-Multicasting) tied together with the systems of the present invention telephone companies no longer need to wait for future technology solutions.

Therefore in accordance with a first aspect of the invention there is provided a system for the delivery of broadcast
10 television from a broadcast provider to a subscriber via the Internet Protocol (IP), the system comprising: means at the broadcast provider's location for retrieving broadcast television signals; means at the broadcast provider's location for configuring the television signals into IP format for transmission over a broadband backbone network; and a management system for managing a subscriber's access to the television signals.

In a preferred embodiment the system employs an interactive
20 program guide (IPG) that offers a subscriber access to multiple scheduling and servicing functions including browsing and searching using a menu driven, 'point and click' process.

Further, the system contemplates the use of an IP Multicast protocol for TV broadcast and near video on demand services. Additionally, an IP Unicast protocol may be used for video on demand service.

30 Significantly, all of these features are delivered via IP and ATM technologies using a single point of access rather than a combination of delivery systems such as satellite and cable.

The present system makes use of a decoder at the subscriber's location to convert the IP format into a form for viewing on a television or computer monitor. The decoder for a television is incorporated into a set top box associated with the TV while the decoder for the computer monitor will typically be installed in the PC.

The management aspects of the invention result in the ability to remotely manage client devices (for example set top boxes) at the subscriber's location. Such management includes remote diagnostics and notification of data updates.

In accordance with a second aspect of the invention there is provided a method of delivering TV broadcast from a broadcast provider to a subscriber over a broadband, IP enabled network. The method comprises: obtaining broadcast TV signals for the broadcast provider; converting the broadcast signals to IP format; transmitting the converted signals over the network; and providing a management function to manage a subscriber's access to broadcast signals.

In a preferred embodiment the converted signals are in a MPEG encoded format.

Brief Description of the Drawings

The invention will now be described in greater detail with reference to the attached drawings wherein:
Figure 1 is a high level diagram of a video broadcast system in accordance with one aspect of the present invention;

Figure 2 is a more detailed diagram of the system of Figure 1;

Figure 3 is an architectural block diagram of network elements;

Figure 4 illustrate the operational aspects of the Digital TV Manager;

Figure 5 is a layered diagram illustrating the relationship of system components;

Figure 6 is a depiction of one example of an interactive
10 program guide (IPG);

Figure 7 illustrates an exemplary information banner appearing in the IPG;

Figure 8 illustrates an alternative IPG;

Figure 9 is a block diagram of the past TV concept according to on aspect of the invention; and

Figure 10 illustrates a system for concurrent transmission of MPEG-1 and MPEG-2 encoded signals.

Best Mode for Carrying out the Invention

20

Figure 1 is a high level diagram of the basic elements of a video delivery system. Video source 12 retrieves signals for broadcast from various sources such as satellites. These signals are delivered to a video encoder 14 via NTSC (PAL, SECAM) video signals where they are converted to an IP Multicast form and subsequently sent out by a service provider 16 over a broadcast network to a Digital Subscriber Line Access Multiplexer (DSLAM) 18 which might be located in a telephone company central office. The IP Multicast signal
30 from the DSLAM 18 is delivered to a subscribers residence over an xDSL link such as an Asymmetric Digital Subscriber Line (ADSL) where it is received by an ADSL modem 20 and delivered to a client server such as a Set Top Box (STB) 22.

Figure 2 is a slightly more detailed representation of the basic concept of the present invention. As shown the video source 12 is a satellite located at head-end 24, which may be operated by a broadcast provider such as a telephone company or other service provider. Head end 24 interfaces with a broadband network 26 through a IP multicast router 28. As noted the broadband network is IP compatible (for example, IP Multicast) and has sufficient bandwidth capacity to transport encoded video signals. A subscriber to the broadcast service has access to the network via a broadband link such as a Digital Subscriber Line (DSL), for example Asymmetric Digital Subscriber Line (ADSL), Hybrid Fiber Coax (HFC) Fiber to the Curb (FTTC) or wireless service such as Local Multipoint Distribution System (LMDS). ADSL is of particular significance because it allows a broadcast provider to deliver programming to residential communities over existing copper wire without having to delay introduction of the services until the other access technologies become widely available.

The subscriber can access the TV broadcast with either a computer 30 having an associated CPU or a television 32 with a set top box 22. The set top box 22 in this implementation includes decoding circuitry for decoding MPEG-1 and/or MPEG-2 as well as IP Multicast. The computer 30 may be equipped with an appropriate MPEG card or appropriate software if the broadcast is to be viewed on a computer monitor. Set top box 22 may be activated by an interface unit such as a key board or remote device 23.

The broadcast provider as shown in Figures 1 and 2 is able to access television broadcast signals from various sources

such as satellite 12, off-air broadcast or a storage medium providing movies or the like. The service provider encodes the broadcast signal (MPEG) and makes it available to service subscribers through the broadband network 26 using the Internet protocol.

Also shown in Figure 2 is the Digital TV Manager (DTVM) 40 that provides end to end management of services and resources of the integrated broadcast delivery system. DTVM
10 40 is linked to the network 26 via a transport router 42.

Figure 3 shows in greater detail the architectural configuration including the home or customer equipment, the broadband IP network and services and the DTVM services. In Figure 3 a second aspect of the deliverable services, i.e. Internet access is shown.

For standard broadcast signals and pay per view (PPV) or near video on demand (NVOD) services a multicast IP protocol
20 is used in order to make efficient use of bandwidth. With this protocol numerous subscribers can have access to a program at the same time. For true video on demand service, however a unicast IP protocol is used.

Figure 3 illustrates in block diagram format the various elements of a broadcast delivery system according to the invention. As shown, the home appliance section includes a personal computer 30 and TV with set top box 22. Access to the network is through a xDSL access element such as an ADSL
30 Transmission Unit (ATU) 20. The broadband IP Network and Services section includes access router 18 and the transport network 'cloud' 26. The transport network 26 has access to the various broadcast features such as Video on Demand (VOD)

50, Near Video on Demand (NVOD) 52 and e-mail 54 and Web access through the Internet 56.

The DTVM section 40 contains the multiple service features available to a subscriber of the system. These include but are not limited to billing and reporting, Interactive Program Guide (IPG) access, connection and channel packaging service and information banner service.

- 10 Figure 4 is an operational view of the system shown in Figure 3. The Digital Subscriber Line Access Multiplexer (DSLAM) 18 at the edge of the high speed IP network is a network device which may be located at a telephone company central office. The DSLAM enables a telephone company to provide subscribers with xDSL, such as ADSL, technology and to connect the subscriber to a fast backbone such as an ATM network. The ATM network routes the various broadcast services, previously mentioned, to the DSLAM which, in turn makes them accessible to subscribers via their computer 30
20 and/or set top box 22.

- Figure 5 shows in a layer format the relationship between service and resource providers respecting the overall TV broadcast delivery system. At the bottom layer (layer 1) are the equipment and appliance suppliers such as set top box and computer suppliers, etc. The second layer (layer 2) represents the service provider such as a Telco who make available the IP and other protocols necessary to transport the services and features between the provider and
30 subscriber. The third layer (layer 3) includes the functionality of the DTVM according to the present invention. As indicated these include Customer and Admin

services, Reporting and Billing services and IPG and Browser clients.

The DTVM allows Service Providers such as Telcos to offer an alternative to cable TV as presently known. Through the DTVM interactive TV can be integrated with Web Browsing, Web-based Email, VOD and pay per view services. Customized services including self-subscription is offered through the IPG. The IPG has access to TV program scheduling information
10 such as TVGuide and makes this information available in electronic form for use by the subscriber. The IPG also provides access to VOD, NVOD, Internet programming as well as video and audio content. The subscriber accesses the IPG through the set top box or through the computer software. In the set top box implementation some memory may be available locally for storing specific information, or alternatively, the entire IPG is maintained in the network. The subscriber typically has a remote control or keyboard for interfacing with the IPG displayed on the television or computer
20 monitor. Scheduling information may be in a grid format or in time slot form as will be discussed later. In any event the interactive nature of the IPG gives a subscriber control over many aspects of the broadcast system. Examples of IPG format and functionality are shown in Figures 6, 7 and 8. The DTVM in conjunction with IPG provides a subscriber with the ability to channel browse for TV programs and Web sites. A seven day channel lineup with scheduled automatic refresh is provided. The IPG client software is automatically updated by the system at regular intervals. Figure 6 shows
30 one example of an IPG menu showing channel, time and schedule content information. Clicking on a highlighted selection displays a brief information banner with relevant data concerning program content and time remaining. This

banner can be expanded as shown in Figure 7 to provide more detail if available. Figure 8 illustrates a second example of an IPG including a program detail banner containing information representing a highlighted channel.

As stated above the IPG is client software that operates in, for example, both a Windows and set top environment and provides a link to the client MPEG-1/MPEG-2 decoder and the client conditional access module. This software also
10 provides the user with access to all broadcast content on the broadband multicast IP network as well as supporting services (i.e. subscription management).

Looking at Figure 5, the IPG data delivery block 60 relates to server software which provides the broadcast content schedules, previously mentioned, to the client IPG software based on the broadcast provider, customer location and customer profile. The server software has the responsibility to extract broadcast content schedules from various existing
20 data sources.

The live MPEG encoder 62 is a component which provides real-time MPEG-1 or MPEG-2 encoding. It encodes analog video and audio inputs to produce MPEG-1 system at MPEG-2 Transport Streams for delivery via an IP multicast network.

The Banner Server 64 is server software which will provide scheduled ad insertion into the client IPG based on time of day, broadcast provider, the customer location and customer
30 profile.

The Near Video-on-Demand (NVOD) Server 66 is a component that provides scheduled managed delivery of pre-recorded material via an IP multicast network.

The Customer profile management system/subscription management system 68 is software to store and track customer preferences, usage patterns, billing status, mailing addresses, client devices, service subscription, etc. It also provides the core data for many of the other
10 components.

The Notifier and Indicator block 70 is software that gives the system the ability to script, send and display on the client server notices and messages such as calling ID and messages waiting.

The Video-on-Demand (VOD) Server 72 is a component which will provide the client access to VOD playback using interactive VCR controls for optimal control. It provides
20 all the tools necessary to store, manage and deliver real-time, full-screen video and audio content.

A Conditional Access System (not shown) consists of both a source and destination module and is responsible for the encryption, as necessary, of data between the source and destination to protect copyrights.

The consumer Services section 80 includes such functionality
30 as connection services, self ordering services and provisioning.

Administration services section 82 includes the importation of IPG data on a scheduled basis. Channel packaging which provides a consumer with the ability to manage their subscription (including self-service) system is a user interface to allow the end user to view, add and delete channels from their service subscription and check their usage and pay bills.

The Report and Billing Service system 84 provides integrated
10 billing and reporting services which enables a subscriber to dynamically monitor service usage and to keep track of service costs on a self-serve basis.

The Database block 86 represents software to provide an information database of broadcast content unique to the broadcast distribution system provider to feed the IPG database.

The Operational Services component or End to End network
20 management system 88 has management software to integrate the control of all the broadcast distribution system components into a networked management framework, including quality of service management and usage collection.

The interactive nature of the services provided by the broadcast system of the present invention gives a subscriber considerably more options as to what programs may be watched and when they may be viewed. Figure 6 provides an elementary example of an interactive broadcast schedule. As shown,
30 program listings for a range of TV channels for a particular time period is given. With a listing such as this displayed on a TV monitor a viewer can scan the list, click on a desired program and the television will tune in to selected

channel. Figure 8 illustrates another version of a program guide known as a preview IPG according to the present invention. Electronic program guides per se are known and it will be apparent to one skilled in the art that a form of chart best suited for the viewer's purpose can be designed.

The following description identifies some of the features available through the system of the present invention.

- 10 The system includes all the necessary software for a broadcast provider to offer broadcast television over Internet Protocol (IP), including IP multicast and unicast, which allow channel browsing by selecting IP multicast streams. IP multicast is characterized by the sending out of data to distributed servers on a multicast backbone network. For large amounts of data (including video transmissions), IP multicast is more efficient than normal Internet unicast transmissions because the server can broadcast a message to many recipients simultaneously. Unlike traditional Internet
- 20 traffic that requires separate connections for each source-destination pair, IP multicasting allows many recipients to share the same source. This means that just one set of packets is transmitted for all the destinations.

- The system has the ability to broadcast television digital signals over existing copper wire (DSL technologies), or any other broadband IP enabled network including LMDS and Hybrid Fiber Coax (HFC). According to the present invention the system has the ability to script, send and display messages
- 30 to a client device screen in real time. Mechanisms used to accomplish this include IP multicast and/or SNMP. Messages may include icons that relate to the message available to be viewed. The user can press a key on a remote device to

retrieve the corresponding message via SNMP or Unicast. The messages can include, for example, calling line ID notifications and message waiting indicators.

With this system the automatic service provisioning of a television channel online is possible. This eliminates the need for service provider or Telco trucks to go to the consumer's location to add or remove new channel offerings. The system allows consumers to change channel/package
10 information online without the need for equipment and/or personnel's physical presence to be dispatched to a consumer's home to connect or disconnect the appropriate channels. Additionally, the DTVM allows management, remotely, of the client devices including the ability to query and reset key indicators such as system health indicators, e.g. MPEG diagnosis, application and network status, e.g. current viewed channel, current NFS server, and re-initialize the client device. This may be accomplished by, for example, a SNMP protocol. Further, the DVTM offers
20 the ability to remotely inform the client device (e.g. STB) that new data and/or software is available and should be retrieved. This may be accomplished by, for example, IP multicast and/or SNMP.

Household consumers are able to self-service their accounts, add and remove channels, view and/or pay broadcast provider's real-time and end-of-period bill summaries online.

30 The interactive electronic program guide allows access to such enhanced video features as Video on Demand (VOD) or Near Video on Demand (NVOD). VOD is an umbrella term for a wide set of technologies that enables individuals to select

videos from a central server for viewing on a television or computer screen. Additionally, the system affords a service provider to make available games on demand. This service is similar to VOD wherein Nintendo-type games are available for access by subscribers. A consumer can choose a game from the IPG or using a Web user interface. A subscriber is charged per game/time played.

10 It is also within the scope of the invention for a service provider to assign a URL to a channel number. A URL is an address used to enable an Internet browser program to find a particular Internet resource. Using this feature a subscriber could view a URL channel on the IPG similar to a video channel. Customers would be able to scan through URL channels and select a desired URL by entering the associated numbers from the remote device in the same way as video channels are selected. Going through a URL channel would switch the client device (STB, for example) to a web browser and thereby access a selected web page. In the same way the
20 system can allow for channel hotlinks. While watching a program or when a program is highlighted on the IPG, the user can operate a remote entry device to activate a transfer to a dynamic web page. The web page could display, for example, information on the program, on the channel, or on the subject matter currently being shown. The system could also provide links to related topics.

The system acts as a virtual VCR, with the ability to schedule, record and playback various programs in the
30 network. It is anticipated that one or more servers in the network will maintain a recording of recently aired programs for access by a user at some finite time after the program was initially shown. Thus the system acts as a backup video

source, enabling a viewer to retrieve previously aired programs for viewing at their choice of times. In the PC implementation the PC hard drive can optionally serve as a storage medium for previously aired programs. The system will also allow a customer to view a list of programs recorded, watch one of the programs from the list, set up the system to remotely record programming on a network storage device either in real time or in advance. A Remote storage device and associated software effectively records

10 only one copy of a tagged program for access by multiple users later. Figure 9 shows the past TV and network VCR aspects of the invention. Past TV uses one or more video servers 90 in the network that continuously stores the IP Multicast TV content from a number of previous days (the number is application specific). The stored data is indexed and made available via the HTML based IPG through the STB. Network VCR uses the video server 90 to provide a subscriber with all the features of a VCR plus random access. The server 90 stores the multiple programs from the IP multicast

20 TV content, indexes them and makes them available to the subscriber via the IPG.

The system acts as an intelligent agent providing the ability to remind a viewer of an upcoming program, enabling recommendations by the system to consumers about program content based on user criteria, system gathered data, and/or an outside source, such as TV Guide, movie critics, etc.

The system will also allow the multicast backbone network to

30 activate a television set or a VCR. With this feature, a subscriber is able to have the television turn on at a predetermined time as well as set the VCR to record a program at the same time or another pre-selected time.

With the broadcast system of the present invention a viewer or subscriber will have the ability to personalize or customize channel selection, for example, create a list of favorite programs. Through this feature a viewer can scan the interactive broadcast schedule, select favorite programs for a viewing interval and have the television automatically switch to those channels at the appropriate times.

- 10 Virtual recording allows the viewer to "record"/store a program for viewing at a later time. In addition to this recording feature the system also gives a viewer a one touch search feature. Through this feature a viewer can configure the system with certain searching criteria such as program theme, by actor, by program/movie title, etc and with the one step searching feature retrieve the requested programming information from the IPG.

- The viewer is also provided with the ability to view a
20 program's video trailer from the electronic program guide when a viewer "clicks on"/selects that program.

- The household consumer is given the ability through the interactive nature of the system to choose from different payment options for the programs selected for viewing, such as a channel subscription or pay-per-view (PPV). This means that a user can purchase a pay-per-view event in real time in a self-serve manner. A PPV event is determined using data sent and stored on the client device. Typically, before a
30 user can view the PPV programming, he/she will be required to confirm the purchase of the event. This will normally involve the set up of a purchase password that requires the

user to enter the correct password to purchase the PPV event and view the event at its scheduled time.

The provider is also able to provide concurrent transmission of each channel via MPEG-2 and MPEG-1 to allow fall back when access bandwidth becomes impaired or client does not support MPEG-2. This, in effect, is a backup system if failure occurs on the main transmission facility. The ability to recognize the failure of a delivered video signal and switch to an alternate signal is based on a configurable algorithm. This increases the level of broadcast availability in the event of a loop (e.g. xDSL) impairment, encoder failure, or facility/network failure. This also allows for multiple set-tops in a single home to negotiate for best available video. This is shown in Figure 10.

The system of the invention permits transcoding of satellite transmission directly to IP multicast MPEG. This takes existing digital transmissions from a satellite and reprocesses them for delivery on an IP Multicast delivery system. The advantages of this are that it lowers the cost of head-end equipment (satellite dish, etc.) by replacing the encoder with a transcoder, and it also maximizes the quality of the signal being delivered from a digital signal source at the head-end. It is only digitized once, and remains that way. At the broadcast provider location a split/distributed head-end (signal from satellite) can also be employed to optimize transport facility cost.

One of the significant features of the present invention is that a viewer is able to see their household's viewing history logs/household repeats (programs that are viewed regularly, or programs that have been seen before, for

example). This, obviously, provides a parent the means to determine the amount of television being viewed by children and whether the programs watched are suitable.

The system also provided for still-picture channel browsing by the viewer when available. This means that a viewer will be able to see a still "view" of a program listed in the electronic program guide.

- 10 Other features provided by the invention include Multicast download where information required to boot a network device to a multicast group is constantly delivered by a network server. The DHCP server is configured to return the multicast address and port as parameters in a BOOTP response. The network device is programmed to join the multicast group and download a bootstrap program to local memory and boot from the local memory rather than across the network. Also, the system can provide a multicast filesystem wherein a server constantly delivers a read-only filesystem
- 20 to a multicast group. A network device is programmed to access the filesystem by joining the multicast group and waiting until the requested file appears. Encryption is used for security and compression is used to minimize bandwidth. Since multicast UDP may lose packets, the multicast group is rejoined and holes in the files are filled if holes exist.

Industrial Applicability

- In summary, this invention is applicable to technologies
- 30 such as xDSL, MPEG-2, MPEG-1, Internet Protocol (IP), including IP multicast and unicast existing copper plant, or any other broadband IP-enabled network including LMDS and EFC. The system will work with a personal computer or with a

television set in conjunction with a set-top box and a remote control/keyboard. The system allows broadcast providers to deliver broadcast television and Internet access to subscribers over, for example, existing copper access lines, utilizing the Internet protocol.

While particular embodiments of the invention have been described and illustrated it will be apparent to one skilled in the art that numerous alternatives and variation can be
10 implemented. It is to be understood, however, that such alternatives and variations will fall within the scope of the invention as defined by the appended claims.

Claims:

1. A system for the delivery of broadcast television from a broadcast provider to a subscriber via the Internet protocol (IP) said system comprising: means at said broadcast provider's location for retrieving broadcast television signals; means at said broadcast provider's location for configuring said television signals into IP format for transmission over a broadband backbone network; and a management system for managing a subscriber's access to said television signals.
2. A system as defined in claim 1 wherein said IP format is a multicast transmission originating from a single point of access.
3. A system as defined in claim 2 further including conversion means at said subscriber's location for converting said IP multicast into a format for display on a monitor.
4. A system as defined in claim 3 wherein said conversion means includes a decoder in a set top box and said monitor is a television.
5. A system as defined in claim 3 wherein said conversion means includes a decoder in a computer and said monitor is a computer monitor or television.
6. A system as defined in claim 3 wherein said management system includes an interactive program

guide (IPG) containing schedule information relating to programs available for viewing by said subscriber, said schedule being available for display on said monitor.

7. A system as defined in claim 6 wherein said subscriber has means to interface with said IPG displayed on said monitor.
8. A system as defined in claim 7 wherein said means to interface is a remote control or a keyboard.
9. A system as defined in claim 1 wherein said broadband backbone network includes an xDSL link.
10. A system as defined in claim 9 wherein said broadband backbone network includes a local multipoint delivery system (LMDS) wireless link.
11. A system as defined in claim 4 wherein said means to configure includes means to encode said television signal into a MPEG format.
12. A system as defined in claim 11 having means to provide concurrent transmission of MPEG-1 and MPEG-2 encoded television signals.
13. A system as defined in claim 12 wherein said concurrent transmission increases availability of television signals to said subscriber by recognizing a signal delivery failure through one transmission form and switching to the alternate concurrent transmission.

14. A system as defined in claim 12 wherein said concurrent transmission permits multiple set top boxes at said subscriber's location.
15. A system as defined in claim 3 having remote diagnostic means for remotely managing said conversion means including; resetting and re-initializing said conversion means and notifying said conversion means of new data or software to be retrieved.
16. A system as defined in claim 7 including means to script, send and display messages in real time on said monitor.
17. A system as defined in claim 16 wherein said messages include calling line identification notifications and message waiting indications.
18. A system as defined in claim 11 including means to provide a pay per view event in real time on a self-serve basis.
19. A system as defined in claim 11 including means to provide games on demand on a self serve basis.
20. A system as defined in claim 7 wherein said IPG displays Uniform Resource Locators (URLs) assigned to a channel location.

21. A system as defined in claim 20 wherein selection of one of said URLs provides a subscriber access to a web browser.
22. A system as defined in claim 20 wherein said IPG includes a background process whereby URLs are attached to broadcast programs such that a subscriber has access to underlying links respecting a viewed program.
23. A system as defined in claim 7 including means to remotely record broadcast programs for access by a subscriber on a self-serve basis.
24. A system as defined in claim 7 including means to record selected broadcast programs and to make said recorded programs available to subscribers on a self-serve basis.
25. A system as defined in claim 7 including subscription management means whereby a subscriber is able to self-manage selection and connection of channel packages.
26. A system as defined in claim 7 including banner service means for insertion of information banners in said IPG.
27. A method of delivering TV broadcast from a broadcast provider to a subscriber over a broadband, IP enabled network, the method comprising: obtaining broadcast TV signals for said broadcast provider; converting said broadcast signals to IP format;

transmitting said converted signals over said network; and providing management means to control a subscriber's access to said signals.

28. A method as defined in claim 27 further comprising the step of providing an interactive program guide viewable by a subscriber on a subscriber's viewing monitor.
29. A method as defined in claim 28 wherein said subscriber is provided with means to access said interactive program guide in order to implement service related features provided by said service provider.
30. A method as defined in claim 29 wherein said service related features include the ability to self-configure service options.
31. A method as defined in claim 27 wherein boot information is delivered by a server at said broadcast provider location to a client device at said subscriber's location by a multicast protocol.
32. A method as defined in claim 31 wherein encryption and compression are used in said multicast protocol.

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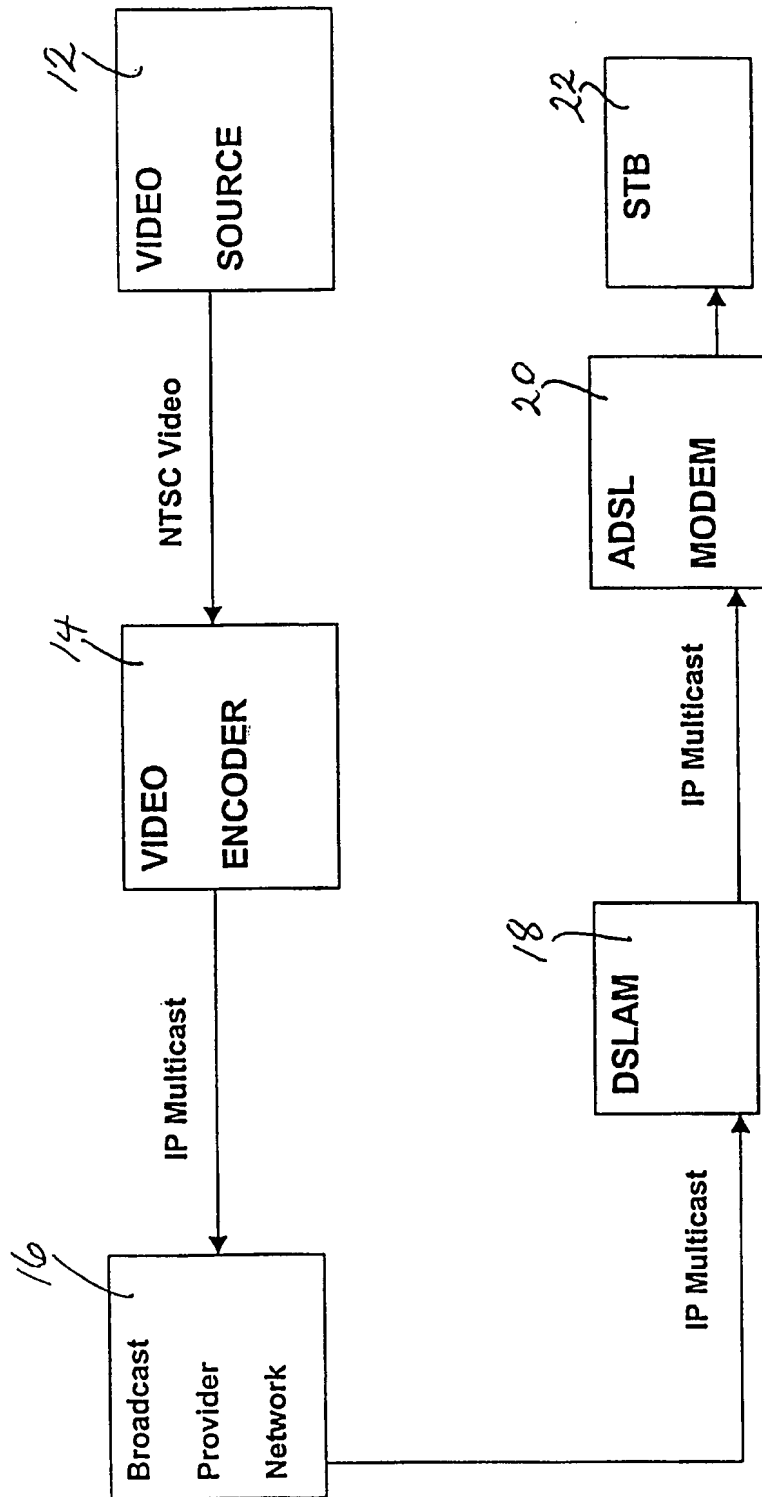


FIG. 1

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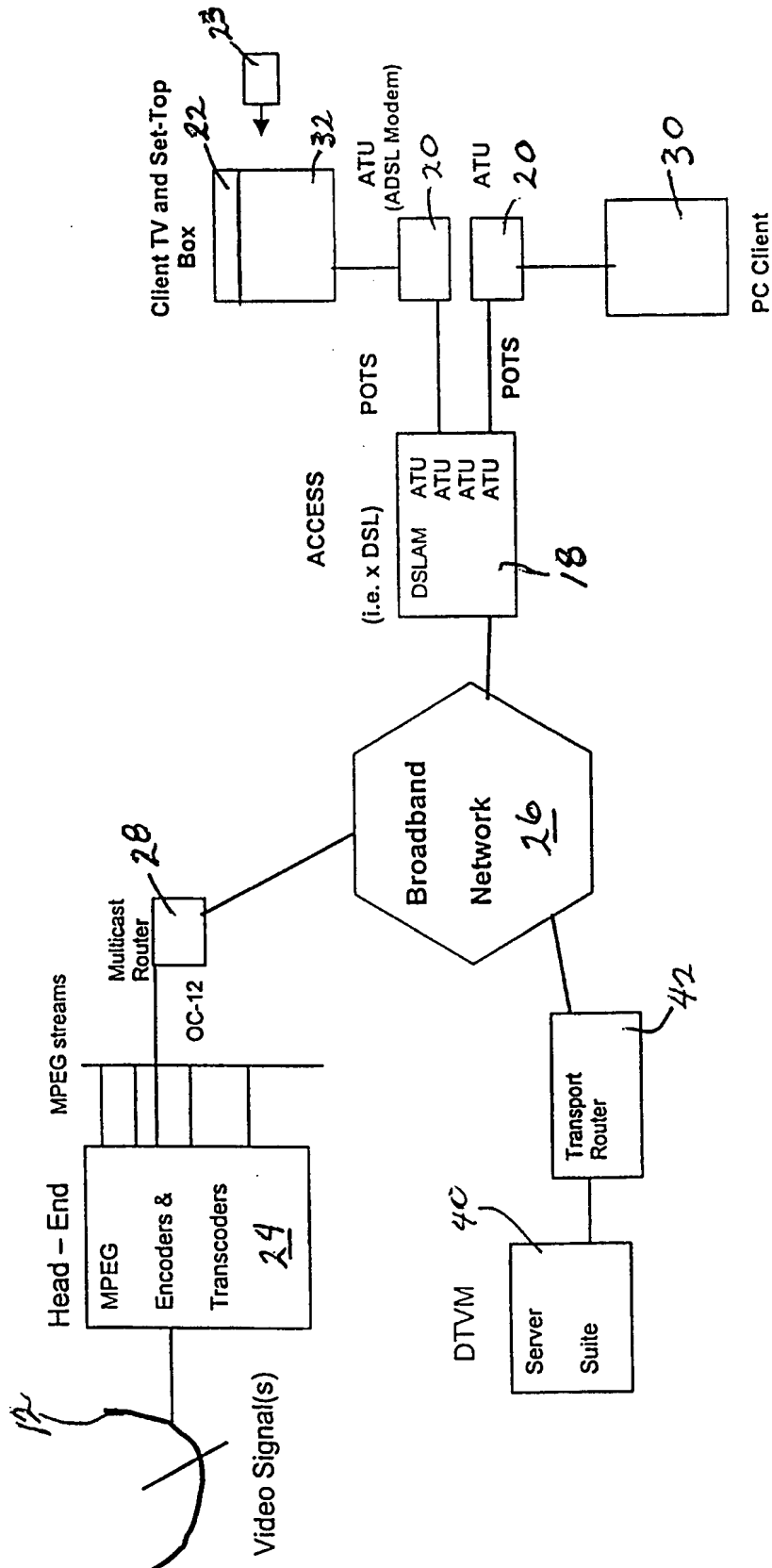


FIG. 2

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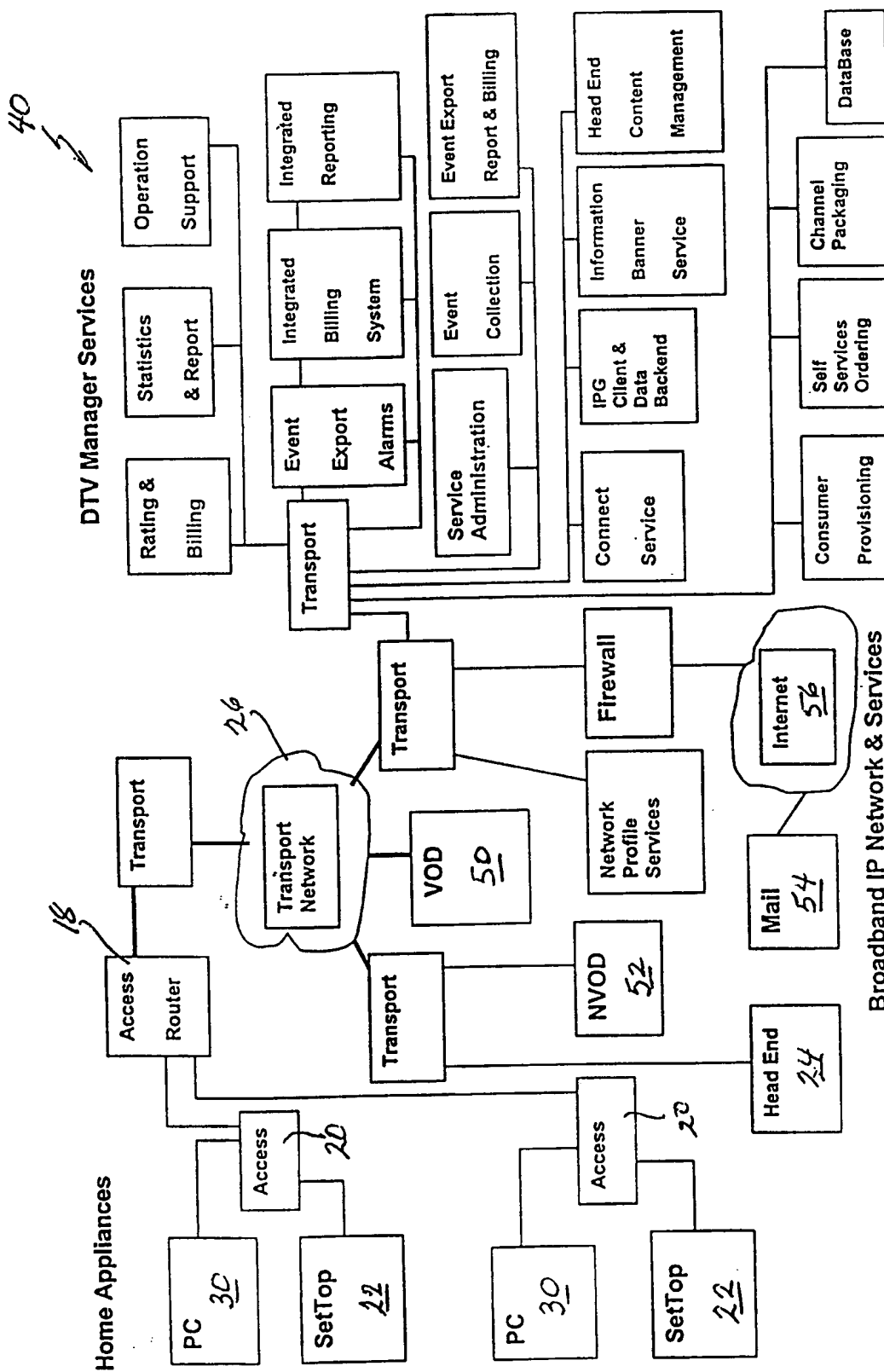
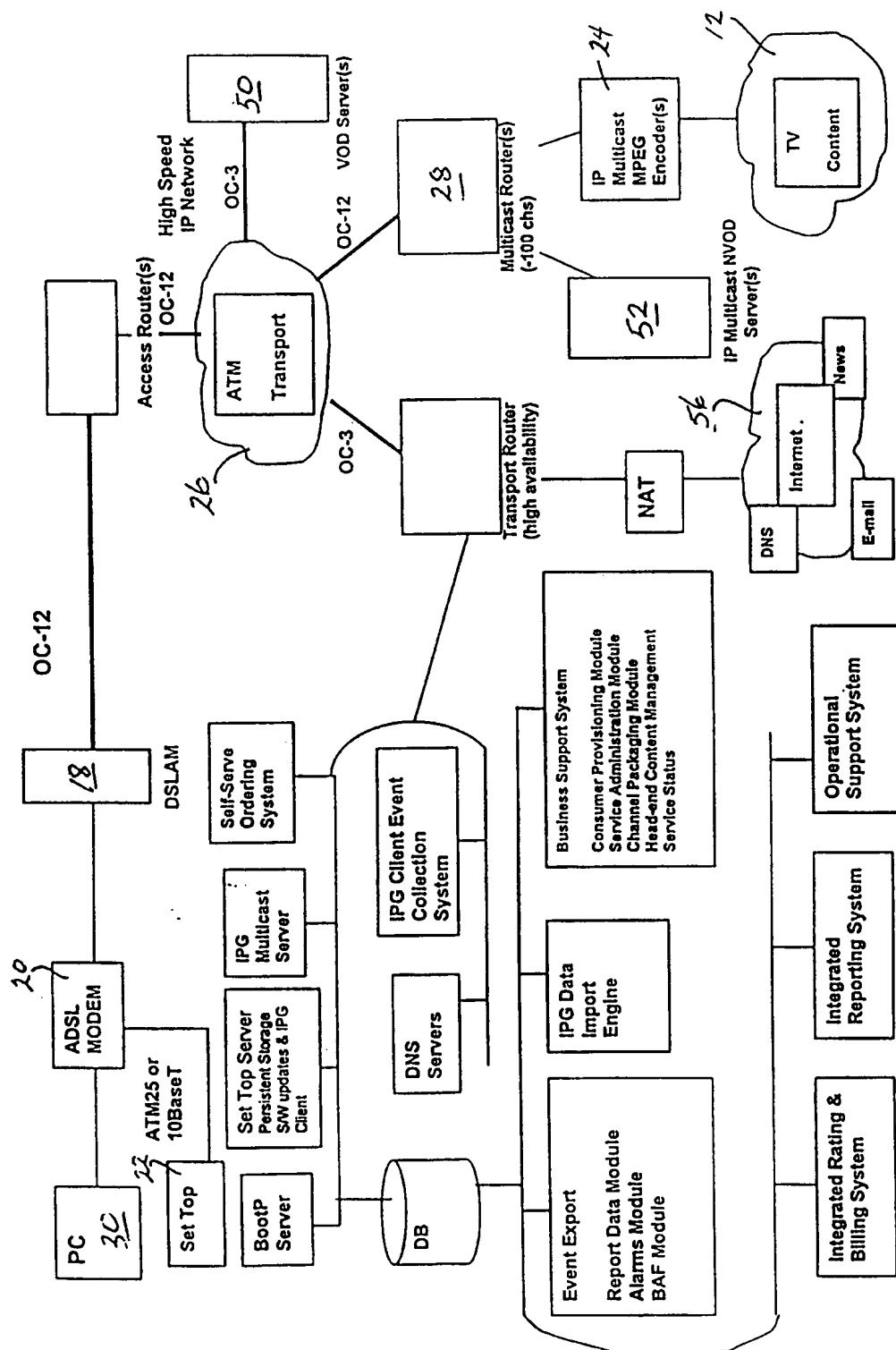


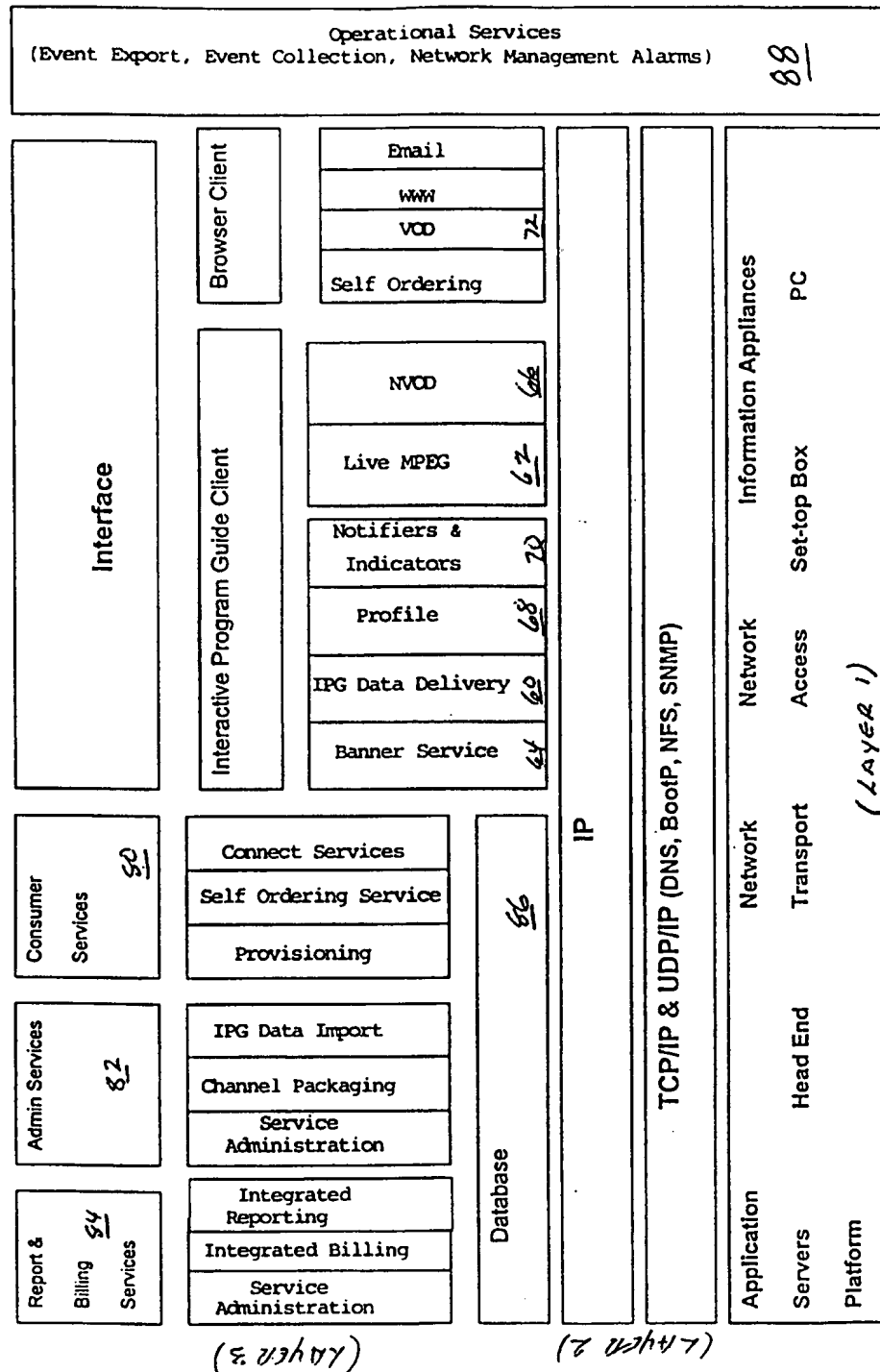
FIG. 3

FIG. 4



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FIG. 5



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Friday, December 04, 1998

10:30AM

16 HIST Bonnie and Clyde

10:00PM - 12:30AM Notorious Depression-era bank robbers Bonnie Parker and Clyde Barrow run rampant across the southern U.S. for 21 months

Today	10:00 PM	10:30 PM
DIS 13	Movie Magic	World of Horses
FAM 14	Dinosaurs	The Barefoot Executive
HGTV 15	Home Additions	Just Ask Jon Eakes
HIST 16	Bonnie and Clyde	
LIFE 17	Martha Stewart Living	Tourist
MM 18	Tribal Gathering '97	

FIG. 6

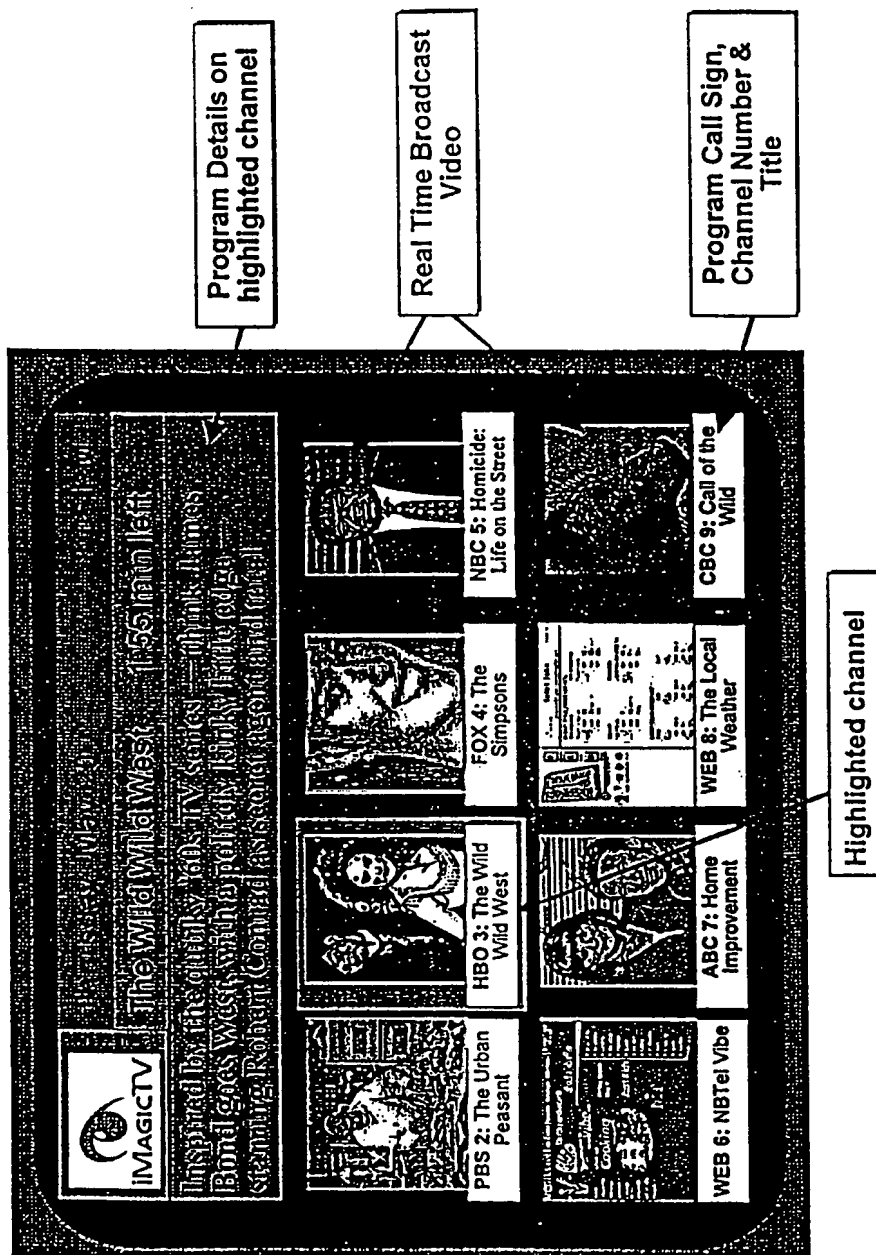
7/10

CBC 3 2:00PM – 2:30PM	Wednesday, October 14, 1998 2:15pm
	SPECIAL: Nature and The Elements TV Y 15 min left
Explore the oceans natural habitat and the ongoing struggles for survival. Award-winning underwater cinematography.	

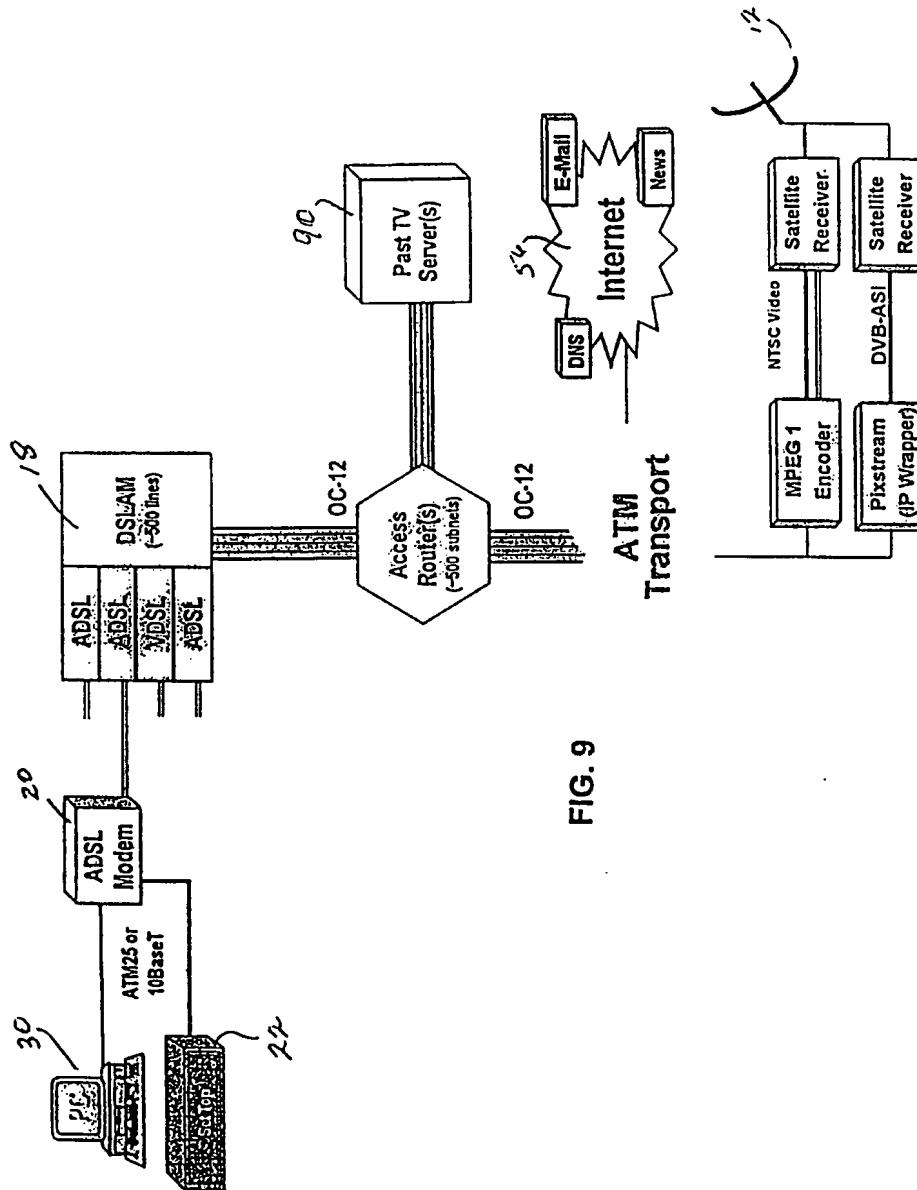
FIG. 7

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FIG. 8



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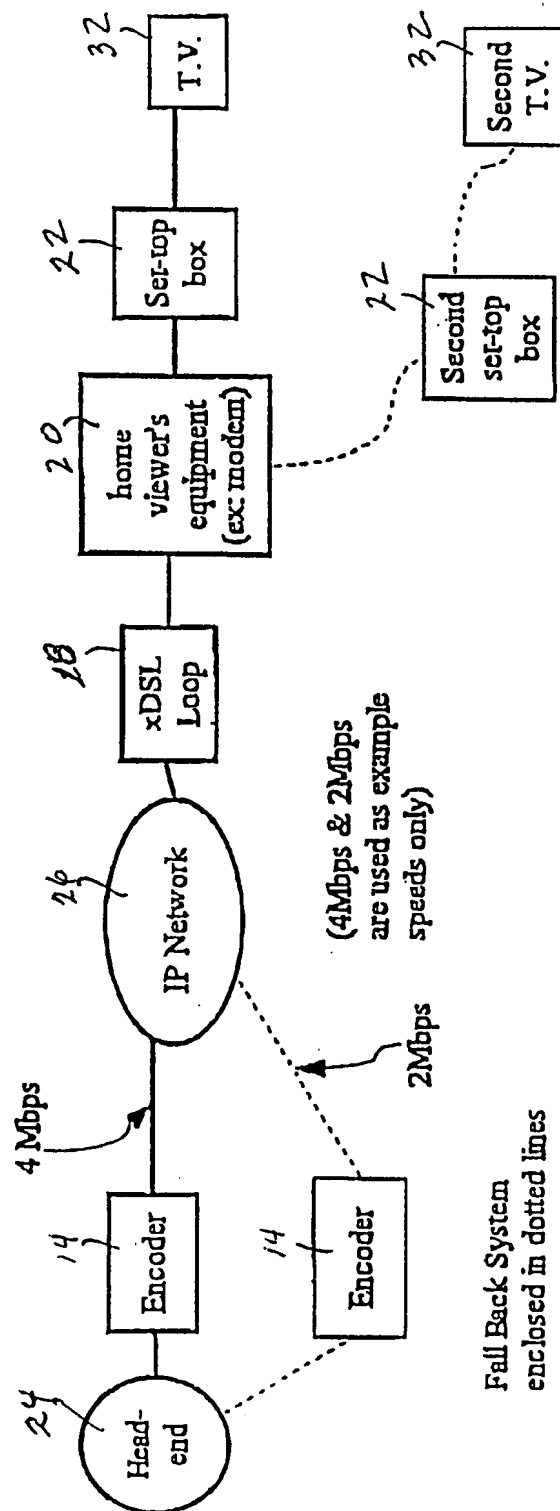


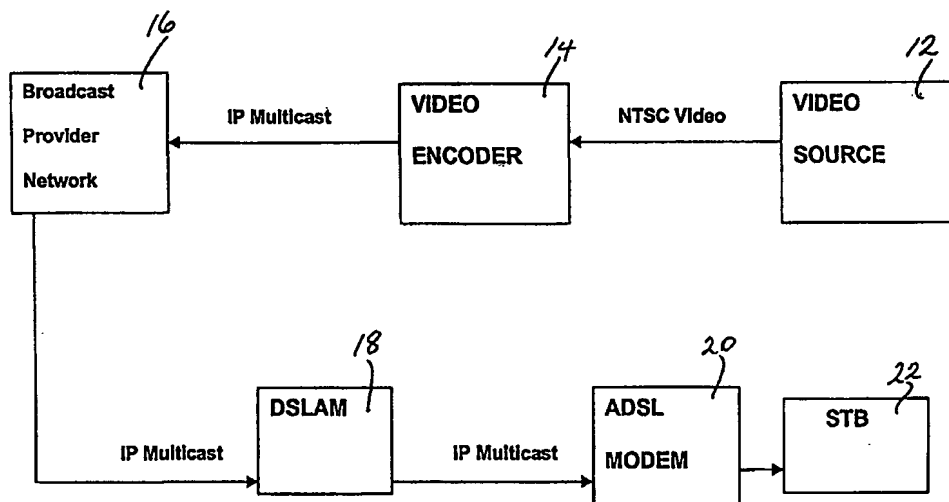
FIG. 10



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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			(43) International Publication Date: 9 December 1999 (09.12.99)
(21) International Application Number: PCT/CA99/00505		(74) Agent: MACGREGOR, George; Marks & Clerk, Station B, P.O. Box 957, Ottawa, Ontario K1P 5S7 (CA).	
(22) International Filing Date: 3 June 1999 (03.06.99)			
(30) Priority Data: 60/088,135 4 June 1998 (04.06.98) US 9812218.7 5 June 1998 (05.06.98) GB		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).	
(71) Applicant (for all designated States except US): IMAGICTV INC. [CA/CA]; 14th floor, One Brunswick Square, P.O. Box 303, Saint John, New Brunswick E2L 3Y2 (CA).			
(72) Inventors; and			
(75) Inventors/Applicants (for US only): CAMERON, Allan [CA/CA]; 5 Clark Hill Crescent, Saint John, New Brunswick E2L 5P6 (CA). POMEROY, Trenton [CA/CA]; 2328 Rothesay Road, East Riverside, New Brunswick E2H 2K5 (CA). ALSTON, David [CA/CA]; P.O. Box 96, Welsford, New Brunswick E0G 3G0 (CA). HIGGINS, Sean [CA/CA]; 468 Millidge Avenue, Saint John, New Brunswick E2K 2N4 (CA). JONES, Ian [CA/CA]; 9 Capri Avenue, Rothesay, New Brunswick E2E 4Y1 (CA). SWANSBURG, Darren [CA/CA]; 13 Logan Drive, Quispamsis, New Brunswick E2E 1B1 (CA). FURLONG, Jeff [CA/CA]; 36 Lake Road, Quispamsis, New Brunswick E2E 4P9 (CA).		Published With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.	
		(88) Date of publication of the international search report: 9 March 2000 (09.03.00)	

(54) Title: TELEVISION DELIVERY SYSTEM



(57) Abstract

A system for delivering broadcast television over the Internet Protocol is described. A broadcast provider obtains television signals from traditional sources such as satellite or cable and encodes the signals for delivery to a subscriber/user over an IP enabled broadband network. An IP multicast protocol is used for conventional TV programming and near video on demand movie selections. An IP unicast protocol is used for video on demand services. A user/subscriber has a television/set top box or a PC with appropriate software to decode the IP format for program viewing. An interactive electronic program guide, viewable on the subscriber's monitor, provides the subscriber with access to a range of viewing features and system management functions.

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/CA 99/00505

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 H04N7/24 H04N7/173

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	ALMEROOTH K C ET AL: "THE USE OF MULTICAST DELIVERY TO PROVIDE A SCALABLE AND INTERACTIVE VIDEO-ON-DEMAND SERVICE" IEEE JOURNAL ON SELECTED AREAS IN COMMUNICATIONS, vol. 14, no. 6, 1 August 1996 (1996-08-01), pages 1110-1122, XP000620595 ISSN: 0733-8716	1-5, 27
Y	abstract sections I, II, and VI on pages 1110-1112 and 1120-1122 figure 1 --- -/--	11, 18, 19

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

20 December 1999

Date of mailing of the international search report

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Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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X	ZAHARIADIS T ET AL.: "Adaptation of Internet access on a broadband" PROCEEDINGS OF THE SECOND IEEE SYMPOSIUM ON COMPUTERS AND COMMUNICATIONS, 1 - 3 July 1997, pages 507-511, XP002116279	1-5,27
Y	sections 1 and 2 on pages 507 and 508 abstract; figure 1	6-10, 15-17, 20-26, 28-32
A	--- WO 96 17306 A (ORACLE CORP) 6 June 1996 (1996-06-06)	1-3,27
Y	abstract; figure 2 page 6, line 1 -page 7, line 1	11,18,19
Y	--- KHASNABISH B: "BROADBAND TO THE HOME (BTTH): ARCHITECTURES, ACCESS METHODS, AND THE APPETITE FOR IT" IEEE NETWORK: THE MAGAZINE OF COMPUTER COMMUNICATIONS, vol. 11, no. 1, 1 January 1997 (1997-01-01), pages 58-69, XP000679058 ISSN: 0890-8044	9,10
A	abstract page 59, right-hand column, line 3 - line 28 table 2	1,27
Y	--- WO 97 42763 A (SCHEIN STEVEN ;KLOSTERMAN BRIAN L (US); STARSIGHT TELECAST INC (US) 13 November 1997 (1997-11-13)	6-8,16, 17, 20-26, 28-30
	the whole document	
A	--- WO 96 41478 A (TV GUIDE ON SCREEN) 19 December 1996 (1996-12-19)	6-8,16, 17, 20-26, 28-30
	the whole document	
A	--- US 5 657 072 A (CRITES BRIAN D ET AL) 12 August 1997 (1997-08-12)	6-8,16, 17, 20-26, 28-30
	the whole document	
A	--- EP 0 805 594 A (SONY CORP) 5 November 1997 (1997-11-05)	6-8,16, 17, 20-26, 28-30
	the whole document	

	-/--	

INTERNATIONAL SEARCH REPORT

International Application No

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Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 734 589 A (HUDSON JR HENRY G ET AL) 31 March 1998 (1998-03-31) abstract column 13, line 47 -column 14, line 9 ---	15,31,32
A	US 5 635 979 A (HUDSON JR HENRY G ET AL) 3 June 1997 (1997-06-03) abstract column 14, line 30 - line 47 ---	15,27, 31,32
A	US 5 666 293 A (HUDSON JR HENRY G ET AL) 9 September 1997 (1997-09-09) abstract column 33, line 46 -column 36, line 53 ---	15,27, 31,32
A	EP 0 594 353 A (AMERICAN TELEPHONE & TELEGRAPH) 27 April 1994 (1994-04-27) abstract ---	15,27, 31,32
A	US 5 448 568 A (DELPUCH ALAIN ET AL) 5 September 1995 (1995-09-05) abstract; figure 1 ---	15,27, 31,32
A	US 5 594 491 A (TAYLOR LAWRENCE E ET AL) 14 January 1997 (1997-01-14) abstract; figure 1 page 86, left-hand column, line 37 -right-hand column, line 1 ---	1-5,11, 12,27
A	RAMANUJAN, R. ET AL.: "Traffic control mechanism to support video multicast" PROCEEDINGS OF IEEE INTERNATIONAL CONFERENCE ON MULTIMEDIA COMPUTING AND SYSTEMS '97, 3 - 6 June 1997, pages 85-94, XP002116280 abstract ---	1-3,27
A	LOCKWOOD, J.W. ET AL.: "Providing multicast video on demand using native-mode" ISCAS '98. PROCEEDINGS OF THE 1998 IEEE INTERNATIONAL SYMPOSIUM ON CIRCUITS AND SYSTEMS, vol. 4, 31 May 1998 (1998-05-31) - 3 June 1998 (1998-06-03), pages 53-56, XP002116281 section 2 on pages 53-54 abstract; figure 1 ---	1-3,27
A	US 5 633 810 A (MANDAL KALLOL ET AL) 27 May 1997 (1997-05-27) abstract --- -/--	1-3,27

INTERNATIONAL SEARCH REPORT

International Application No

PCT/CA 99/00505

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>M REHA CIVANLAR ET AL: "A PRACTICAL SYSTEM FOR MPEG-2-BASED VIDEO-ON-DEMAND OVER ATM PACKETNETWORKS AND THE WWW" SIGNAL PROCESSING. IMAGE COMMUNICATION, vol. 8, no. 3, 1 April 1996 (1996-04-01), pages 221-227, XP000580003 ISSN: 0923-5965 abstract; figure 4 -----</p>	1,27

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA 99/00505

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
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because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
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- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-3 with 4,5,11-14,18,19, and 27

delivery and management of interactive television, in particular comprising means to provide concurrent transmission of MPEG-1 and MPEG-2 encoded television signal and directed to achieve a fall-back when access bandwidth becomes impaired or the client does not support MPEG-2.

2. Claims: 1-3 with 6-8, 16-17, 20-26, and 27 with 28-30

delivery and management of interactive television, in particular comprising a management system including an Interactive Program Guide and directed to solve scheduling problem.

3. Claims: 1 with 9,10

delivery and management of interactive television, in particular involving a delivery network including an xDSL link, and directed to deliver programmes over already existing copper wires.

4. Claims: 1-3 with 15, and 27 with 31-32

delivery and management of interactive television, in particular including remote diagnostic means or delivery of boot information, and directed to allow remote management of the client devices.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/CA 99/00505

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9617306 A	06-06-1996	US 5805804 A	08-09-1998
WO 9742763 A	13-11-1997	AU 3058397 A	26-11-1997
		CA 2253293 A	13-11-1997
		EP 0896775 A	17-02-1999
		US 5940073 A	17-08-1999
WO 9641478 A	19-12-1996	US 5589892 A	31-12-1996
		AU 700302 B	24-12-1998
		AU 6258596 A	30-12-1996
		CA 2223057 A	19-12-1996
		CN 1190517 A	12-08-1998
		EP 0856227 A	05-08-1998
		JP 11505094 T	11-05-1999
		PL 323914 A	27-04-1998
US 5657072 A	12-08-1997	NONE	
EP 0805594 A	05-11-1997	JP 9298775 A	18-11-1997
		CN 1166122 A	26-11-1997
		SG 64423 A	27-04-1999
US 5734589 A	31-03-1998	US 5666293 A	09-09-1997
		US 5768539 A	16-06-1998
		US 5978855 A	02-11-1999
US 5635979 A	03-06-1997	AU 2657995 A	21-12-1995
		WO 9533338 A	07-12-1995
		US 5666293 A	09-09-1997
		US 5768539 A	16-06-1998
		US 5978855 A	02-11-1999
US 5666293 A	09-09-1997	US 5734589 A	31-03-1998
		US 5635979 A	03-06-1997
		US 5768539 A	16-06-1998
		US 5978855 A	02-11-1999
		AU 2657995 A	21-12-1995
		WO 9533338 A	07-12-1995
EP 0594353 A	27-04-1994	US 5373288 A	13-12-1994
		CA 2106834 A,C	24-04-1994
		DE 69319059 D	16-07-1998
		DE 69319059 T	19-11-1998
		JP 2834397 B	09-12-1998
		JP 6237462 A	23-08-1994
		US 5559503 A	24-09-1996
US 5448568 A	05-09-1995	CN 1114814 A	10-01-1996
		EP 0680216 A	02-11-1995
		JP 8046950 A	16-02-1996
US 5594491 A	14-01-1997	AU 1431897 A	28-07-1997
		WO 9724877 A	10-07-1997
US 5633810 A	27-05-1997	EP 0785657 A	23-07-1997
		JP 9294121 A	11-11-1997
		US 5761416 A	02-06-1998